

SECTION IV.—RIVERS AND FLOODS.

RIVERS AND FLOODS, SEPTEMBER, 1914.

By ALFRED J. HENRY, Professor of Meteorology in charge of River and Flood Division.

[Dated Washington, D. C., Oct. 31, 1914.]

The rivers during September were, as a rule, at low stages, as is characteristic of that month. The rainfall of the month was not sufficient in amount to produce flood stages in any of the larger rivers, but torrential rains caused damaging floods in some of the smaller streams. This fact was strikingly exemplified at Kansas City, Mo., where the heavy rain of the 6th-7th caused an overflow in the valley of Turkey Creek, a small stream that passes through the western suburbs of the city, wrecking and damaging property to the extent of \$1,500,000. On account of the intensity of the rainfall and by reason of the tremendous damage that was wrought by what is usually an insignificant stream, it is deemed advisable to reproduce a detailed account of the storm written by Mr. P. Connor, local forecaster, in charge of the Kansas City station.

Torrential rains also fell in eastern Iowa and adjoining localities on the 14th and 15th, but the area of the heavy rains was not great enough to cause a flood in the Mississippi at that point, although an important rise was recorded. Heavy damages were suffered in the city of Dubuque, Iowa, and Galena, Ill., the estimated amounts being \$5,000 and \$2,000, respectively.

HEAVY RAINSTORM AT KANSAS CITY, MO.

By P. CONNOR, Local Forecaster.

[Dated Weather Bureau, Kansas City, Mo., September, 1914.]

Labor Day was ushered in at Kansas City, Mo., by the greatest rainstorm in any 24-hour period in the history of that station, the rainfall being 7.03 inches, 6.94 inches of which fell in 9 consecutive hours and 46 minutes, from 11:49 p. m. September 6 to 9:35 a. m. of the 7th. The remainder was in sprinkles in the afternoon of the 7th. The damage due to the flood has been estimated at \$1,500,000.

The storm was one of a series of closely related thunderstorms due to an area of moderately low barometer over the Southwest, a loop from which extended to northwest Missouri, with pressure nearly two-tenths of an inch higher in the lower Mississippi Valley, and an increasing high in Minnesota and the adjacent territory, diminishing to the northern Rocky Mountain region, but still 0.12 to 0.16 inch higher in Nebraska than in northwest Missouri.

Sunday, September 6, was a moderately warm day; maximum temperature, 90.6°, and humidity, 68 to 70 per cent. The barograph trace showed the actual pressure to be about 28.84 inches (corrected to about 29.88) and stationary. The wind was light and variable, northwest to southwest during most of the forenoon and until 2 p. m., from the south in the afternoon and evening, and southeast to east from 9:15 p. m. until the heavy rain began near midnight. Considerable alto-cumulus and strato-cumulus clouds prevailed during the day. A few local thunderstorms appeared in the north in the afternoon and evening, which passed to the east.

The usual drop in temperature occurred and the barograph trace rose about 0.05 inch. The wind increased to 36 miles an hour at 11:55 for 5 minutes. Scattered raindrops fell from 11:40 p. m. for about 14 minutes, when the downpour began. The heavy rain continued until 12:15 a. m. of the 7th; then with irregular intensity until 12:35 a. m., when it became ordinary light rain until 4 a. m., when it became again decidedly heavy and continued until 9 a. m.; then variable until time of ending at 9:50 a. m. The rainfall to this time was 6.94 inches. The sun came out a few minutes later and shone until nearly noon. Light showers in the afternoon gave 0.09 inch, raising the amount to 7.03 inches.

An excellent record of hourly rainfall was obtained, the following being the amounts:

Sept. 6:	Inch.
11.40 to midnight.....	0.91
Sept. 7:	
Midnight to 1 a. m.....	0.84
1 a. m. to 2 a. m.....	0.11
2 a. m. to 3 a. m.....	0.05
3 a. m. to 4 a. m.....	0.05
4 a. m. to 5 a. m.....	0.25
5 a. m. to 6 a. m.....	0.62
6 a. m. to 7 a. m.....	1.86
7 a. m. to 8 a. m.....	0.92
8 a. m. to 9 a. m.....	1.11
9 a. m. to 9:50 a. m.....	0.22
Total.....	6.94
12 noon to 4:10 p. m.....	0.09
Grand total.....	7.03

Lightning began in the west-southwest about 10:30 p. m., rapidly increasing in frequency. By 11 p. m., or shortly after, the first thunder was heard, and the lightning was flashing over the whole sky. While the thunder was loud at times, it lacked that deep, sonorous quality which makes houses tremble and windows rattle. The lightning struck many objects and buildings and disabled 4,000 telephones. The long-distance telephone lines also suffered greatly.

RAINFALL, FRACTIONS OF AN HOUR.

The greatest amount in 5 minutes was 0.64, which is the greatest in any 5-minute period since the establishment of this station, July 1, 1888. It fell from 11:54 p. m. to 11:59 p. m. of the 6th. The greatest amount in any 10-minute period was 1.01 inches from 11:52 p. m. of the 6th to 12:02 of the 7th. In 15 minutes 1.26 inches fell—from 11:52 p. m. of the 6th to 12:07 a. m. of the 7th. In 1 hour 1.97 inches fell—from 5:55 to 6:55 a. m. of the 7th.

RAINFALL AT NEAREST SUBSTATIONS.

Following is a record of the rainfall at the nearest substations, covering the evening of the 6th and the succeeding day:

Harrisonville.....	0.33
Maryville.....	0.56
St. Joseph.....	1.56
Iola.....	0.04
Lexington.....	3.05
Kidder.....	5.50
Topeka.....	2.76
Horton.....	4.14

The rains at Kidder, Mo., and Horton, Kans., show important local development.

DAMAGE CAUSED.

The damage caused in this community by the heavy rain was enormous, being estimated at \$1,500,000. It happened chiefly from the approach of the Southwest Boulevard to the West Bottoms through Rosedale, Kans., and the valley of Turkey Creek, a small branch having its source in numerous gullies in Johnson County, Kans., about 30 miles to the west by south of Kansas City. The creek follows a tortuous course through a valley one-fourth to one-half mile in width, bordered by steep hills, and empties into the Kansas River at Nineteenth Street and the State line (in the West Bottoms).

The drainage area of the valley is about 22 square miles. The creek is 12 to 15 feet wide. Nature never intended that such a watercourse should carry off the storm water from that valley. Every extraordinary rain caused an overflow, which ran out with much greater freedom in former years than at present. Commercial necessity, or avarice, has not only claimed part of the original small creek bed, but has actually bridged the stream in several places with buildings; and there are many plank bridges. All of those obstructions held the water back, and as a consequence the flood extended from hillside to hillside.

In the central depression, in which is located the Frisco; Atcheson, Topeka & Santa Fe; and Missouri, Kansas & Texas railroad tracks; and other small industrial plants, the water was 12 feet deep and more. After the water receded the district presented a deplorable appearance. The wreckage of houses, animals, and drift was piled up in great masses, and black, slimy mud was 2 to 3 feet deep in the streets and buildings through which the water ran. The flood carried away the contents of the lumber yard, overturned heavy freight and passenger cars, destroyed long stretches of the railroad tracks, and many of the smaller buildings and manufacturing plants. About 2,000 buildings were damaged and 200 families were left homeless, and 3 lives were lost as a result of the flood. On the Kansas side the damage was about \$150,000 to residences and business property and the loss to railroads about \$350,000.

EXCESSIVE RAINFALL AT CAMBRIDGE, OHIO, JULY 16, 1914.

On July 16, 1914, 7.09 inches of rain fell at Cambridge, Guernsey County, Ohio, in 1½ hours. It is reported that the rainfall was very local and did not cover an area over 5 miles square. The damage to roads and bridges in the storm area was probably more than \$2,500, not including the loss to fields, fences, and farm crops.

MEAN LAKE LEVELS DURING SEPTEMBER, 1914.

By UNITED STATES LAKE SURVEY.

[Dated Detroit, Mich., Oct. 2, 1914.]

The following data are reported in the "Notice to Mariners" of the above date:

Data.	Lakes.			
	Superior.	Michigan and Huron.	Erie.	Ontario.
Mean level during September, 1914:				
Above mean sea level at New York.....	Feet. 602.80	Feet. 580.48	Feet. 572.37	Feet. 246.09
Above or below—				
Mean stage of August, 1914.....	+0.04	-0.16	-0.22	-0.24
Mean stage of September, 1913.....	-0.03	-0.45	-0.38	-0.65
Average stage for September last 10 years.....	+0.07	-0.41	-0.07	-0.25
Highest recorded September stage.....	-1.28	-2.95	-1.57	-1.52
Lowest recorded September stage.....	+1.31	+0.82	+1.09	+2.00
Probable change during October, 1914.....	0.0	-0.2	-0.3	-0.3

Below are given the mean lake levels for March and April of the current year. These reports seem to have been lost in the mails when first mailed to this bureau.

MEAN LAKE LEVELS DURING MARCH, 1914.

By UNITED STATES LAKE SURVEY.

[Dated Detroit, Mich., Apr. 2, 1914.]

Data.	Lakes.			
	Superior.	Michigan and Huron.	Erie.	Ontario.
Mean level during March, 1914:				
Above mean sea level at New York.....	Feet. 601.91	Feet. 580.00	Feet. 571.46	Feet. 245.67
Above or below—				
Mean stage of February, 1914.....	-0.27	-0.06	-0.27	-0.20
Mean stage of March, 1913.....	+0.40	-0.10	-0.99	-1.04
Average stage for March last 10 years.....	+0.25	-0.14	-0.34	-0.22
Highest recorded March stage.....	-0.37	-2.95	-2.39	-2.14
Lowest recorded March stage.....	+1.25	+0.89	+0.63	+1.37
Probable change during April, 1914.....	0.0	+0.3	+0.7	+0.6

MEAN LAKE LEVELS DURING APRIL, 1914.

By UNITED STATES LAKE SURVEY.

[Dated Detroit, Mich., May 4, 1914.]

Data.	Lakes.			
	Superior.	Michigan and Huron.	Erie.	Ontario.
Mean level during April, 1914:				
Above mean sea level at New York.....	Feet. 601.83	Feet. 580.06	Feet. 572.10	Feet. 246.75
Above or below—				
Mean stage of March, 1914.....	-0.08	+0.06	+0.64	+0.06
Mean stage of April, 1913.....	+0.19	-0.72	-1.93	-1.11
Average stage for April last 10 years.....	+0.16	-0.39	-0.42	+0.25
Highest recorded April stage.....	-0.86	-3.17	-2.03	-1.68
Lowest recorded April stage.....	+1.29	+0.84	+0.84	+1.91
Probable change during May, 1914.....	+0.3	+0.3	+0.3	+0.5